DOCUMENT RESUME

ED 474 529 EF 006 248

AUTHOR	Lackney, Jeffery A.
TITLE	Classrooms of the Future: Thinking out of the Box.
PUB DATE	2001-09-04
NOTE	19p.; Paper presented at the Annual Michigan Educational Facilities Conference (9th, Bellaire, MI, September 4, 2001).
AVAILABLE FROM	For full text: http://schoolstudio.engr.wisc.edu/futureclassrooms.html.
PUB TYPE	Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	*Building Innovation; Educational Change; *Educational Facilities Design; *Educational Trends; Facility Case Studies; Teaching Methods

ABSTRACT

This presentation on educational facilities design emphasizes the overarching strategy of observing the activities of learning that take place in and out of the classroom setting, and the importance of taking a fresh look at what children do in school so that new ways can be found of approaching school design. The presentation addresses these questions: (1) Where is educational practice headed? In other words, what is or are the emergent paradigms of education that should be designed for? (2) How has the classroom changed over time to accommodate educational change? (3) What strategies can be used to start anticipating educational change? and (4) What are the big trends in school planning that designers should be aware of? The presentation also contains 14 school design case studies illustrating examples of "out-of-the-box" responses to 21st-century educational change. (EV)

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Classrooms of the Future: Thinking Out of the Box

Jeffery A. Lackney, Ph.D., A.I.A.

University of Wisconsin-Madison

An invited paper presentation given at the Ninth Annual Michigan Educational Facilities Conference, Shanty Creek's Summit Conference Center.

September 4, 2001

Introduction

For some years now Edward De Bono has had us "thinking laterally", while Neuro-linguistic programmers have had us "Reframing", more recently we have been encouraged to "work smarter", "continuously improve" "change our paradigm," and now its" thinking-out-of-the-box."

I think what all these phrases have in common is that they are challenging us to THINK BEFORE WE ACT - to reflect on what we do and try to be more creatively responsive to the REAL PROBLEM. I hope I can get us to think about what we are doing. I want us to take time to explore the dimensions of our boxes; their shape, color and texture before we leap into to unknown. We just might need to reinvent ourselves before we can reinvent what is around us…

Stephanie Pace Marshall, Administrator of the Illinois Mathematics and Science Academy, Aurora, Illinois I think really makes our task clear: "We cannot change what we do until we change how we think, and we cannot change how we think until we change who we are."

I have found it possible to investigate the problems of educational design from a variety of disciplinary lenses. Moving from department to department has given me a unique opportunity to test my ideas about educational design in a multi-disciplinary environment.

My latest effort, at UW-Madison has been the creation of the School Design Research Studio in which I am dedicated to cooperatively investigating the ecology of places for learning as well as promoting collaborative processes in school planning and design.

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But it has been PRACTICE, educational planning, that has required me to "think out of the box" in order to respond to real world problems of school design. Research has been, for me, a "mopping up exercise," an attempt to verify what we intuitively think we know.

I hope my presentation today will reflect some of that multidisciplinary journey and assist you in developing your own insights into your practice.
In thinking creatively about school planning and design, I want to emphasize the overarching strategy of observing the activities of learning that take place in and out of the classroom setting. It is by taking a fresh look at what kids do in schools that we might find some new ways of thinking about school design.

We also need to take the reality of educational change into account. Following a physical space standard is not always going to yield responsive design - it can only be a place to begin, and where thinking out of the box starts.

In this presentation I want to answer a few questions:

First, at the risk of over-simplication, I want to ask, where educational practice is headed? In other words, what is or are the emergent paradigms of education we should be designing for?

Second, how has the classroom changed over time to accommodate educational change?

Third, what strategies might we use to start anticipating educational change?

And, finally, what are the big trends we see in school planning that we should be aware of?

I'll finish the presentation with fourteen case studies to illustrate examples of out-of-the-box responses to 21st century educational change.

Paradigm Shifts

A very useful concept for capturing what is going on in education today is the PARADIGM. We use this metaphorically from the very technical way it was defined by Thomas Kuhn, the philosopher of science who in 1962 turned the philosophy of science on its head with his notion of the paradigm shift in his book The Structure of Scientific Revolutions (Kuhn, 1970).

The paradigm is an accepted model or pattern AND I might say for our purposes accepted PRACTICE. Normal science - or practice - actualizes the promise of the paradigm. Normal science or practice is simply what Kuhn would call a "mopping up exercise" - of solving the problems determined to be solvable according the paradigm given enough time.

Newton's theories constituted a paradigm in the natural sciences that were not overtaken until the time of Einstein. All work since Einstein in sub-particle physics is basically a mopping-up exercise - we accept the existence of sub-particles now all we have to do is identify them and study their characteristics and applying them to new technologies.

Anomalies, as Kuhn (1970) refers to them are little cracks in the paradigm that slowly overwhelm and eventually compete with the old paradigm. Kuhn distinguished between normal science and extraordinary science. In our field of educational planning and design we need to begin to move from normal practice to extraordinary practice.

Paradigms in Organizational Theory

Organizational theorists such as John Kotter of the Harvard Business School and of course many other social critics have clearly outlined many of the anomalies present in our society today (Kotter, 1996). It would be untrue to suggest that we operate in non-bureaucratic organizations, although they may be a bit flatter with all the mid-manager layoffs of the 1980s. Data is certainly distributed more widely - the Internet has seen to that - but not when data is of use to those in control like the record industry, who succeeded in controlling Napster. Leadership is the buzzword of the day, but we still need management, and we still lack leaders. These anomalies are however, certainly finding their way into the actions of our institutions and slowly wearing down old patterns of behavior.

Paradigms in Education

If we begin to focus on the ruling paradigm of education, we can as well describe the now familiar Industrial Model and the Knowledge-Age Model borrowing from Costa and Liebmann's summary (Costa and Liebmann, 1997).

Keep in mind, we are still very much in the Industrial Model of Education no matter what you read or hear. The Knowledge-age Paradigm is simply a list of anomalies playing out in education today.

For instance, we are moving from a teacher-centered classroom to a learner-centered classroom. What does this mean exactly? So some it means that learners are in charge of their own learning - they are self-directed - and teachers are master learners, learning along side students. We see individualized learning plans, but usually within a single comprehensive program aligned with a standardized assessment. An anomaly, not a paradigm shift.

For instance, we hear that students need contextualized knowledge, learn not isolated facts, but solve real world problems. Yet, students have classes taught in a problem-based

learning pedagogy in 50-minute segments of time while still being required to go to math class. Again, the Industrial model is still in place.

One last example, reported in Education Week recently: "Hand-held computers are popping up in classrooms nationwide, but are they a worthy learning tool? Many critics say schools have rushed into buying the devices without having an appropriate curriculum in place. In addition, some school leaders say hand-helds too often are used to e-mail during class and to cheat on tests rather than for what they were intended." In other words, teachers see the use of PDAs as an opportunity to cheat on tests using email. Might this story be translated as the new paradigm competing with the old?

Back to the Future

The Knowledge-age Paradigm didn't start with the advent of computers and the fall of factories in the West. John Dewey over 100 years ago is one our earliest touchstones in the US for out-of-the-box thinking in education. He understood the problems with a crowded curriculum, the passive student-as-container, and the limitations of the building in facilitating learning. Dewey's lab school in Chicago only lasted only 8 years, but its influence has been far reaching on educational theory and practice for over century. The theory behind the Laboratory School was the idea of school as a small cooperative society where children at any stage of development can solve problems and where "the systematic knowledge of adult consciousness is gradually and systematically worked out" (Tanner, 1997; xi). An integrated curriculum meant having teachers engage students in French language class by learning to prepare a French dinner in the classroom. Hands on learning meant having students actually build a small cabin to learn about construction. Dewey set out to change educational practice in a way that is still being studied and tested and is still controversial today.

Here is a sketch of what some see as a cultural war that began nearly 100 years ago with John Dewey and Eric Thorndike. Dewey was a proponent of a variety of practices that have come to be associated with the progressive movement: formative evaluations, developmental assessments, multiple measures of student performance, criterion reference testing, contextualized analyses of problems & learning and portfolio assessment. Thorndike, a contemporary of Dewey, was the creator of a stimulus-response model of learning called Connectionism. He argued for a set of practices that have been for the most part accepted by the educational institutions in this country: summative evaluations, high-stakes testing, single measures of performance, norm reference testing, standardized testing, external evaluation of performance.

The Dewey/Thornburg debate has culminated in a 40-year cultural war and at least three successive waves of educational reform movements. The first reforms, in the 1960s were curricular in origin. The second wave of reform in the 1980s was curricular (back-to-basics) a rollback and part governance. The latest wave of reform since the 1990s has been primarily governance with charters, choice and vouchers taking center stage. Whole

school model reforms, such as the Coalition of Essential Schools have also found a foothold.

What is important to consider here at an educational facilities conference is: which philosophy are you planning and designing for? Are you advocating for one philosophy but designing for another?

Evolution of Classroom Design

How has classroom design responded to these paradigmatic shifts in education? Again, what are we designing for?

The Factory Model, which we are, all familiar with did very well for a number of years, especially with the Industrial Model so entrenched in schools. Standardization of curriculum, large group instruction, teacher-centered lecture with the table at the front of the room, these are all very familiar to us all and they remain familiar to most children in school today. If you did a survey of school buildings designed this year, I would argue that this model is still our dominant School Design Paradigm in the year 2001.

However, if you looked inside these boxes what you see the most of is a decreased area for large group since computers are lining up in classrooms. Small group instruction has taken a bite of space as well in the early grades. There are many different of what Roger Barker called "behavior settings" in the classroom. There are plenty of anomalies.

The house plan, initially a response to the middle school philosophy, but now a pattern emerging in all levels of education responds to an emphasis on cooperative learning, and small group project-based learning. When teachers get offices they may slowly relinquish control of the classroom to their students. Technology is often shared. A new paradigm for school design is surfacing…

The full flowering of this new paradigm may be seen in what we might call self-directed learning environments. Students direct their own learning and teachers facilitate that learning. This model reverses the notion of the dominance of large group instruction by having the middle of the house a natural gathering place and having individual learning stations around the perimeter. Technology is dispersed and decentralized throughout the space rather than being concentrated in a lab.

This environment now adequately supports individually-based learning, cooperative learning and many other characteristics of the emerging knowledge-based paradigm in education.

Finally, the notion of learning outside the building as well as inside has emerged in the pedagogy of service learning. Service learning goes well beyond the occasional field trip.

The way to truly integrate the curriculum with the real world is to be in and act upon the real world. The community environment becomes the learning environment.

Strategies for Thinking Outside the Box - or - Seeing the New Paradigm

I'd like to now present a few strategies for thinking out of the box - or- seeing the new paradigm - I have observed in the cases and to some extent in my own practice.

Focus on the Activities of Learning

First, throughout the process of planning and design focus on the activities of learning, not the components of the program. The program is just a response to necessary activity. We can begin to ask really interesting questions such as how do we design for exploration, discovery, experimentation and mastery? How does learning actually take place? What can we observe for ourselves? What do we know from our own experience? What do students tell us?

Listen to Small Voices

Second, listen to the small voices. We so often assume children and youth are not paying attention to the way we are controlling their experience of school. Not true. They are very aware and have many opinions. Instead of dismissing their thoughts, try to listen and hear what they are saying. Probably more importantly, there is evidence that especially with young children, their self-concepts develop in direct interaction with the environment. Their creation of special places at home for instance is critical to their development of a healthy self-concept. In what ways do you think school buildings support or hinder the positive growth of a child's self-concept? There are a multitude of methods for engaging all ages young and old in the planning and design process. How might our practice be integrated with education in the process of planning a school? How might a school be designed and managed to allow students to continue a creative participation with the environment?

Solve the Whole Problem

When we focus on aspects of the problem we are most familiar with and which we are being paid to solve we may not be addressing the real problem. By attempting to solve the whole problem - that is paying attention to the problems of conflicting educational philosophies and practices, community concerns, institutional barriers, and the social as well as academic needs of children and youth - we as designers will have much more responsive environments. We cannot solve the whole problem alone, that is why we need to look for opportunities of collaborate with others and....

What is out-of-the-box about this school facility is the impact the surrounding community had in the school's making. Parents from the surrounding community lobbied for the school to be constructed. In addition, the community was involved in monthly meetings during the design process as well.

What resulted was a school building that had an explicit focus not only on environmental education but community use as well going beyond the joint use opportunities of the library and multipurpose room. Community use is encourage through a community garden, outdoor classrooms for nature classes, a roof terrace off the media center for public gatherings, and a courtyard that functions as a community square for the neighborhood. Neighborhood festivals are regularly held there. One neighbor commented, "People like to come in and stay a while." Once inside, the school feels like a "high-end conference center", it "entices us to want to stay and talk."

Additionally, the design emphasized small school size to promote a sense of belonging and community in a very diverse student population. Along with the environmental focus, the school design maximizes daylight for its potential impact on learning as well as for reduced energy use. Use of natural materials supports the advocacy of renewable resources. Every classroom has an outdoor patio and trellis for small outdoor peer teaching groups

Case 2: Sonderegger Science Center

Sonderegger Science Center a K16 facility completed in 1999 on the 55-acre Edgewood College Campus, a private Catholic organization that hired the Durrant Group. What makes Sonderegger exemplary is its claim to be the first to integrate science education across age groups and disciplines - those being physics, biology and the natural sciences. The facility encourages collaboration between not only the disciplines but also collaboration between high school and college faculty who share office space in the building. In effect, the facility and the campus it is apart of form a highly interactive community of learners of all ages.

Teams of students work on projects while bringing university-level resources to bear on those projects. In one project students for instance were able to use the University of Wisconsin's Arboretum's Graphic Information Systems (GIS) data to inform their project locating sites for a proposed prairie. Data elementary students collect might be entered into a national database. High school students can work alongside college professors as well as take college-level courses. Science education college students only have to go down the hall to elementary and high school classes for student teaching opportunities.

Case 3: The Memorial HS Neighborhood Centers Project

The Neighborhood Centers Project at James Madison Memorial High School aimed restructuring a 30-year-old 2,000-student building into four smaller 500-student learning communities. A Federal Small Learning Communities Grant supported the project.

Memorial is a National School of Excellence, but has in the past few years witnessed an increasing divide between high performing and low-performing students, an increasingly ethnically diverse student body, and a strained school culture/climate based on these factors.

Unlike many existing schools that are breaking large schools into schools-within-a-school, Memorial is retaining its existing comprehensive curriculum and forming neighborhoods further subdivided into multi-aged block and backyard groups with their own governance structures. The intent of the project is to create a more collegial school culture, building student leadership capability and ownership.

As a physical expression of these four neighborhoods, four 2,000-2,500 square foot spaces with direct outdoor green space have been identified as neighborhood centers.

The other BOX was youth involvement. Listening to those small voices. Voices that have never been heard before. In this case, getting students first interested and then involved in the creation of these neighborhood centers was an objective directly related to the goals of the project - the formation of a collegial school culture. The process of involving youth - especially teenagers - is complex. Out of 2,000 students, 100 participated in an opening session and four groups of 10 continued through four workshops to clarify the details of the organization of each center.

For the most part, students have been openly critical and suspicious of a hidden adult agenda. Many are cynical as to the success of the project One student voiced, "they can't make us be friends." However, at least half of the students have taken a wait and see attitude.

Case 4: The Conserve School

The Conserve School, located in the Northwoods of Land O' Lakes, Wisconsin, is a non-sectarian, independent, 9-12 coed boarding school dedicated to environmental conservation and ecological sustainability. It was planned by Team Interplan and is scheduled to be occupied in 2002. The academic building houses 108,000 square feet of classroom space.

The Conserve School was a vision of the late James Lowenstine who donated his land and trust to the construction of a school that would produce well-rounded individuals

Suspend Disciplinary Boundaries

We are not solving an architectural problem; we are solving a problem of supporting various objectives for learning. That means architects need to think like an educators. Educators must in turn learn to think like designers. School Boards and taxpayers need to begin to think beyond the bottom-line to see how education and learning is critical to the well being of the entire community.

In one planning process HGA worked on a few years ago, the idea of a "Da Vinci" studio was created. It was conceived as a studio that mimicked the studio of Leonardo Da Vinci's that contained objects of art as well as science all within his immediate reach. He was a Renaissance thinker, and so this planning group felt their students needed to aspire to. But, it required them to stop thinking in terms of disciplines and start thinking in terms of learning which has no boundaries.

Maintain a Beginner's Mind

Finally, maintain a beginner's mind. As the Zen master Suzuki said: "In the beginner's mind there are many possibilities, but in the expert's there are few". What was it like for you when you were young? So many times we forget to imagine a time when we were young. What did we like doing? What places inspired us? These are probably the places that will inspire the youth of today. Why are we not providing those places for learners today?
Although it is always a good idea to have experts to rely on, there are great advantages to being a beginning novice. As a novice there are many possibilities that can be explored. No idea is thrown out until the novice has had a change to investigate its merits. This can be important when the problem being worked on has few precedents. Experts have long truncated these possibilities to the most practical and efficient solutions - they are not as likely to go back and look at things from a fresh multiple perspectives like a novice might.

Teratrends in Educational Design

There are least three, I'll call teratrends (mega, giga and then tera) in school planning and design - 'terra' for terrestrial, meaning 'grounded' in practice.

Teratrend 1: Communities of Learners are Forming

The first is that communities of learners are forming. Resources and facilities are being shared. Social services are being integrated into schools.The link between the business community has strengthened providing opportunities to contextualize knowledge about acting in the world. Recognizing that learning is lifelong has encouraged the design of schools for multiple ages.

Teratrend 2: Schools Will Become Much Smaller

Schools will become much smaller. The notion of smallness, of creating small learning communities is one of the most researched factors in the conditions of schooling. Smaller class sizes have been shown to increase student achievement by providing opportunities for increased time for and quality of student-teacher interaction. However, much of the benefits of small classes are of course mediated by teacher quality. Smallness extends to the size of the school as well where school culture and climate are experienced. More extracurricular participation takes place in smaller rather than larger schools. Aggressive behavior decreases. Achievement is higher. How small? There are still no definitive numbers, but practice has shown that high schools with groupings as small as 100 students can have significant benefits.

Teratrend 3: Telelearning is Becoming Ubiquitous

Information technology has become apart of education. IT is influencing curriculum and instruction and is becoming integrated with telecommunications and building systems. However, is education using technology as a tool, or is technology-leading education?

According to David Thronburg, of the Thronburg Institute: "Paradigm shifts come when technologies are disruptive to the status quo. On this basis, it is safe to conclude that technology has thus far not produced a paradigm shift in education. Our underlying model of how teaching should be done remains much the same as it was in the pre-computer days. In fact, it remains almost unchanged since the time of Horace Mann. During the intervening years we have nibbled at the edges of reform with our fierce debates about Dewey, Piaget, Gardner, Vygotsky, and other great pedagogical thinkers. We brought in cooperative learning and other improvements to instructional strategies, but the underlying assumption was that the core basis of schools, curriculum, and pedagogy was sound and not in need of transformation."

Thronburg also suggests that we continue to be as he says "hunters and gatherers of information" even in the wired classroom. How can technology assist the generation of new knowledge and not just become a high-tech tool for hunting and gathering of information?

These three terra trends are synergistically changing school design across the country. The question remains however, which paradigm is operating when it employs these three strategies? I will leave that an open question for you to ponder as we move through the case studies…

Case 1: Cragmont School

Cragmont School in Berkeley, California was designed by ELS Architects completed in 1999 a school focuses on environmental education using the landscape as a teaching tool.

who appreciated nature and wildlife ecology. The school's mission is to develop ethical leaders and stewards of ecological sustainability.

This school breaks the box of what a school should be and do. It is arguably the only residential high school focusing on environmental education in the country. The school practices what it preaches by immersing the school directly in the natural environment. The entire site (1,200 acre wilderness setting) boarders two national forests, as well as a federal wilderness area.
The residential units reinforce a community of learners as well with the students living along side their teachers, not unlike the intention behind the design of Thomas Jefferson's University of Virginia campus where students and teachers live and study side-by-side.

Case 5: North Star Academy Charter School

The North Star Academy Charter School located in Newark, NJ was opened in 1999 to serve 144 disadvantaged youth the city.

It is the nature of the charter school to break boxes to survive. Whether we are talking public or private schools, charter schools are practical examples of thinking out of the box.

A recent report summarizing a survey of Charter School Facilities around the country by the Charter Friends National Network and Ksixteen indicates that seven in ten charter schools lease space. It also indicated that charter schools use a variety of creative arrangements from custom built facilities, pre-existing school buildings, offices, retail space, former private school buildings, or places of worship. And over 1/3 indicated that schools share space with other organizations.

Due to limited resources, North Star had a practical problem of finding space for its program. They choose an existing building (an abandoned bank building) in the heart of downtown Trenton where a library, YMCA, park and other community facilities already existed and began to make partnerships and created facility use agreements.

What is unique about this choice is that not only was it the best economic solution for the fledgling charter, it was symbolically better than locating the school in an existing public school building wing. According to the director locating the school in a non-traditional space sent the message to parents that this school was going to be different from what they had experienced in the public schools.

Case 6: McWillie Elementary School

McWillie Elementary School in Jackson, MS, planned by the Educational Design Institute and designed by Dale and Associates is a K-2 facility dedicated to creating a small school setting for activity-based learning. The school was designed for a total capacity of 600 students and divided into five houses of 120 students.

The planning of this school, which included six successive workshops with parents, teachers and administrators, started with the assumption that the activities of learning would drive the design. Early on, the vision of a school dedicated to the philosophy of activity-based learning through second grade emerged as an important driver of the school planning process.

The BOX of the Kindergarten classroom size standard was broken through and applied to every classroom space in the building including first and second grade classrooms. Participants recognized that the developmental learning needs of their students required more space, the kind of space that exists in a kindergarten. So this standard became the standard for the entire school.

The second BOX the McWillie planning group broke out of - although it took some time - was the idea of allowing multiple (sometimes competing) pedagogies co-exist during the planning process. McWillie is the first public school in the state of Mississippi to provide a Montessori program alongside the district's standard program.

In addition, outdoor classrooms, directly accessible from inside every classroom in the school are designed as outdoor rooms that are intended to be managed just like indoor space. Students and teachers are expected to take responsibility for their environment.

Case 7: Alpha High School

Alpha High School in Gresham, Oregon designed by Dull Olson Weeks Architects is a comprehensive high school that integrates a school-to-work program for 150 students at risk. Alpha is the recipient of the 1999 AIA National Honor Award as well as receiving the Certificate of Excellence and Outstanding Design Award from American School and University.

The program at Alpha is over twenty years old; it is the building that is new. At 16,000 square feet it is a small school creating a supportive family environment for both students and teachers. The extensive service-learning program has faculty creating partnerships with business and community groups such that students spend half of their day outside the school working hands-on in a business or community setting.

In addition, a state-funded community employment center is housed in the building, and college courses are offered in the building as well.

The architectural response to this program is just as innovative. It actually takes the notion of flexibility seriously. Whole movable wall units - not your old folding partitions - allow the faculty to change the size of rooms to suit the activity within. Not only that, teacher stations are on mobile carts rather than desks. Students are provided larger project lockers and tables. A real attempt is being made at Alpha to create a learner-centered environment.

Case 8: The Zoo School

The Zoo School or the School for Environmental Studies, in Apple Valley Minnesota, has been occupied since1997 designed by HGA Architects. It has won several awards including a U.S. Department of Education award.
The Zoo school is a small 400 student alternative high school for juniors and seniors interested in exploring environmental studies.

Most of you are probably aware of the Zoo School. I conducted a post-occupancy evaluation of the school for HGA in 1998, a full year after occupancy. There is much that can be said about this school. I want to focus on what I learned while spending a few days in the school interviewing and observing administration, staff and students.

This is a school that was conceived as a direct assault on the BOX of the comprehensive high school. Planning began with the administration asking students who their favorite teachers were, the ones they learned the most from. Those teachers were asked to be on the planning team charged with the creation of a whole new way of delivering education. The planning team spent a full year of planning and visiting innovative programs around the country before an architect (HGA, Inc) was even considered.

They settled on an integrated curriculum and interdisciplinary instructional teams that would support self-directed learning. They also proposed a number of focused areas of instruction, one of them being environmental studies.

The second BOX the Zoo School broke the rule of high schools being larger. The school is small for a high school 400. Now small high schools of this size are becoming more common as many of the cases I've presented are. But, what really breaks the box with the Zoo School is the formal learning groups, which are broken down into four houses of 100 that are further formally broken down into learning groups of 10. Ten students instead of 20 or 25. There is a team of four teachers per 100 students, but the students are grouped in physical spaces designed for ten individual desks. Desks are highly personalized and group cohesion is strong.

I am of the opinion that this particular innovation is what makes the Zoo school so special since it gives the school to the students. Dan Bodet, the principal of the school told me that during the first year several students asked to be transferred back to their home high school - they were not prepared for the intensity and academic rigor of the environment at the Zoo school.

In the center of each house is the Centrum, which contains shared resources for the entire house including technology. The Centrum provides a clear focus for the house and integrates resources.

Teachers' offices are designed to create a relatively small collegial setting through the use of desks that all share a central work/meeting table in the center of the room. The teacher's offices were designed without windows. Teachers did not think they would spend as much time as they do in the rooms. They thought they would be spending more time out in the main open space-supervising students. They find the students are self-directed and do not need direct supervision on might expect in a high school full of teenagers. Now many wish they had a window.

Students respect the boundary of the office door and do not enter unless their teacher invites them into the room.

Responding to the interdisciplinary instructional philosophy, science labs are dispersed into each house. There is no "Science Department".
This environment is not for everybody, but there are probably an enormous number of students for which this particular environment would be beneficial. Do we design for the common denominator in the name of equity for all, or do we attempt to provide a broad range of educational choices for those what them?

Case 9: Center for Applied Technology and Career Exploration

The purpose of the Center for Applied Technology and Career Exploration in Rocky Mount, VA occupied in 1997 is to provide students in this rural community an opportunity to explore career choices in an area of high unemployment. What is so out-of-the-box about this environment is that it is designed to simulate the workplace. The center is described as a state-of-the-art facility that simulates a high-tech corporate office where students work with computer software and hardware actually used in surrounding businesses and industry.

The Center provides a one -semester curriculum for all 8th graders in the district that offers eight career modules (arts, environment/natural resources, manufacturing, engineering, architectural design, legal science, finance, health and human services/medicine). Students pick three areas to explore using various technologies.

The facility contains an interactive laboratory with multi-functional space with a rear screen projection system, whiteboards, touch pad lectern, and laptop computers to support a wide variety of programs. Local businesses in fact share this laboratory for their own events.

Case 10: New Tech High

New Tech High in Napa, California is a small 240 student 11-12 grade high school that opened in 1996 is one of the first schools with the express goal of preparing graduates to participate in the new high technology economy. New Tech High was awarded a state and national Department of Education Demonstration Site and California's Model Digital High School.

New Tech High, which uses Microsoft's Tegrity Weblearner is now a blueprint for the Gates Foundation in creating ten new schools. Classroom learning is converted into content that is delivered over the web with lessons being posted to a server or website delivering that "anywhere, anytime" promise we hear so much about these days.

Most significant about this school is that the schedule - the temporal design of the school sometimes more important than the physical design - is designed to simulate the modern workplace. There are no bells and no class changes. Students are treated like employees. Every student has access to a computer and is assigned an email and a website address for posting work.

(See www.newtechhigh.com)

Case 11: High Tech High

High Tech High in San Diego, California is a similar school to New Tech High that opened in 2000 for 400 students, grades 9-12 that expressly links students to industry mentors at the school and in the workplace. The curriculum focuses on math, engineering and science. Here we have all three tera-trends integrated into one school.

This school is unique in that it is an industry/educator coalition initiated tuition-free charter school. In 1998, a group of San Diego's high technology business leaders in collaboration with local educators identified the problem of finding qualified people to fill a growing number of high tech job opportunities in San Diego. Community partners include AT&T, Cisco, San Diego City Schools, Qualcomm, Nextlink, Intuit, and a dozen more.

The siting and design of the school facilities indicates that the creators of this school were aware of at least the symbolic role of facilities in providing the proper setting for

learning. They located the school NOT in a high school, which was symbolic of the past, but instead redeveloped a 40,000 square foot existing structure within the Naval Training Center (NTC) in San Diego .The NTC community includes a culinary school, an architectural school, the community college district offices, an artist's colony and various public and private agencies. In effect, High Tech High is surrounded by a model, purposeful, productive adult milieu in which to immerse students.

The facility contains 14 classrooms and labs at the center of the building with open areas with high ceilings on either end. There are much more expansive workstation and group project space than is commonly found in a school building. In addition, students have their own workstations. Again, as with New Tech High, the schedule of this school resembles the working world with morning and afternoon blocks (no traditional 50 minute periods here).

Case 12: North Pitt High School and East Carolina University

North Pitt High School and East Carolina University in Bethel, North Carolina, Handsprings to Learning Program provides a representative case for the use of handhelds in schools. For example, In Orland Park, Ill., Consolidated High School District 230 has equipped nearly 1,700 of its 2,200 students and 65 teachers with Palm III handhelds. The Handsprings to Learning Program at North Pitt High School has been designed to further enhance teaching and learning through the use of deployable handheld computers that will soon have wireless connectivity making real the notion of anywhere, anytime learning.

Nationally, proponents argue that handheld computers provide a relatively inexpensive way of getting technology into hands of students (no pun intended).

Elliot Soloway, a cognitive scientist and education professor at the University of Michigan in Ann Arbor, has developed educational software for handhelds at the University of Michigan's Center for Highly Interactive Computing in Education feels we might be making the same mistake of not linking to the curriculum as we did with PCs.

Much of the criticism about hand-held computers and Blue Tooth wireless devices sounds like the same kind of criticism leveled at hand-held calculators in the 1970s and computers in the 1980s - not linked to curriculum, used for games, emailing to cheat on tests. Cheating on tests? - Could we be witnessing the new paradigm challenging the old? Many handheld computers have been banned on campuses since 1989 in Maryland - a band on portable communication devices.

David Thornburg on these devices: "My response was that this teacher's classroom should have a metal detector built into the doorway to scan for electronic gadgets, and that a sign should be placed above the doorway that said (in Latin, preferably) "Students: Please note that nothing (and we do mean NOTHING) that is relevant to your world

outside of school has any place in this room." "Well, guess what: I'm the biggest cheat in the world. Yes, that's right - it is time to confess that I cheat on a regular basis. Every book, speech, and most articles I've ever written were created with the assistance of others -- librarians who tracked down elusive sources for quoted material, friends who turned me on to wonderful research reports, myriad authors whose books fill my library. And, instead of working in isolation writing an essay straight out of my own head, I rely heavily on the properly referenced work of others. So, in the setting of school, I am a cheat and a fraud. Of course, on the rest of planet earth I'm a researcher.

Case 13: Wisdom Hall

Wisdom Hall is a small 2,500 square foot facility housed within Antioch Community High School in Antioch, Illinois designed by OWP&P is designed to serve 50 special needs students.

This program within a school was the brainchild of an energetic and visionary teacher from the start. She asked the design team at OWP&P, what are the learning activities that we want to take place here? Eventually, several goals were agreed upon, that being to accommodate special needs students in improving basic study skills and designing for a variety of learning styles.

The design responded by providing a project area as well as a place for individual study and an area for small group events as well as the traditional lecture space for large group instruction and a computer-based activities area. In effect, there are five (5) different learning settings within a 2,500 square foot learning environment - designed to support a variety of learning styles.

Case 14: Grainger Center for Imagination and Inquiry

Grainger Center for Imagination and Inquiry, also designed by OWP&P, is a 2,840 square foot facility housed in an old home economics classroom within the Illinois Mathematics and Science Academy, Aurora, Illinois the only residential high school in the state, The Grainger Center is designed to serve up to 40 students as one time.

The center is also called the Tinkerer's Workshop in that students tinker with projects of their own design. The program is completed project-based and student driven. Adult researchers act as mentors for students. The Illinois Mathematics and Science Academy is ideally sited near Argon and Fermi labs and the technology corridor and students have come to expect the opportunity to work with scientists from these labs on their projects. As the architect on this project relayed to me, "kid's expectations to work with Nobel Laureates is not even questioned!" Projects are initiated in partnership with leading corporate, private and university research organizations.

Students were engaged in the design through an interactive website where students and teachers envisioned a lab of the future.

The client, Stephanie Pace Marshall, known nationally as an educational leader stated, "Re-invention is not about changing what is, but about creating what is not." She demanded what she called "infinite flexibility lab". MIT's Media Lab influenced the design team. The lab that was designed created layers of flexibility with mobile mini-lab stations that can be grouped for collaborative work or arranged for independent work, a secure space to hold experiments for weeks at a time, a student presentation area with pin up space, curved bench and a swivel countertop (science as theatre) and a think tank area with an Inquiry Wall that includes soft seating. A grid of ceiling trays allows power and data utilities to reach anywhere in the room.

I want to finish with one last thought from Stephanie Pace Marshall: ". If we are truly going to create learning communities for the 21st century, we must look differently at our classrooms, our schools, and our work. We must view them as dynamic, adaptive, self-organizing systems, not only capable but inherently designed to renew themselves and to grow and change - not by the rules established from the top, but by relationships created from within."

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